national gas transmission

Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

May 2014

Project Reference Number

NIA_NGGT0051

Project Registration

Project Title

Wireless Gas Detection Assessment

Project Reference Number

NIA_NGGT0051

Project Licensee(s)

National Gas Transmission PLC

Project Start

May 2014

Project Duration

4 years and 2 months

Nominated Project Contact(s)

John Surtees, box.GT.innovation@nationalgrid.com

Project Budget

£272,740.00

Summary

Fixed gas detection is required within compressor cabs to minimize the risk of an explosion. At the time of each compressor cab construction (from 1970 onwards), the number and location of installed detectors was dependant on the guidance and gas detector technology available at the time. New or additional gas detection is required in compressor cabs as a result of:

- New standards / guidance - BS ISO 21789 (2009) requires that at least one gas detector is located in the ventilation outlet (because a gas leak will always reach this location). This requires one or more gas detectors to be moved or added to the system.
- The gas detectors become obsolete / unsupported by the manufacturer (Requiring detector or system replacement)
- New gas detector technology comes to market that will enhance gas detection within the compressor cab

Replacing, adding or moving gas detection can be expensive as a result of material and labour costs for design and installation of cable infrastructure. Wired gas detectors can also place constraints on where gas detectors can be located.

Wireless gas detection is a new technology to National Grid UK Gas Transmission. It has not been used before to provide detection within a compressor cab environment. A wireless gas detection has the potential to provide:

- Simple, flexible and low cost detector installation (due to quicker installation time, less cables, trays, junction boxes and cabinets and less drawings and documentation)
- The facility to re-locate and optimize gas detector locations at minimal cost
- The facility to add additional gas detection at minimal cost
- More flexible mounting and accessibility options (because the detectors are not constrained by the wiring infrastructure)
- Safer maintenance due to improved access

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

Design and installation of traditional gas detection systems in compressor cabs can be expensive and difficult due to the routing and installation of cabling and junction boxes to reach the required gas detector locations. Once installed it is difficult and can be expensive to optimise the location of or add additional gas detectors to the system due to the restrictions of the cabling and junction boxes and the available locations for safe access.

Method(s)

To determine whether wireless gas detection can provide a secure, long term and reliable solution in UK Gas Transmission compressor cabs, the project scope will be delivered in 3 phases.

Phase 1: Market/Tech Review

- Market Research & Technical Note - Review the current market and liaise with detector manufacturers and suppliers to determine the best wireless gas detector commercially available at present that has potential to provide a solution to the problems identified.
- Detector Challenge and Review Workshop & Technical Note – A workshop will challenge and review the potential use of the selected wireless gas detector. This workshop will incorporate elements of a HAZID and CHAZOP. The workshop will determine potential issues associated with installing and operating the wireless gas detection system.

Phase 2: Short term testing

- One day system tests will be conducted at three different compressor stations. The primary purpose is to assess the system connectivity (signal strength) in different configurations through different cab building types. The final scope of the one day testing will be agreed following output of the workshop.
- A report incorporating the market research, detector challenge and review workshop and system testing technical notes and an assessment of wireless security.
- Stage gate review of results and decision whether to move on to Phase 3 (long term trial).

Phase 3: Long term trial

- A scope of works detailing the required installation for the long term trial, test site and proposed plan.
- Installation of the wireless gas detection system on one site for a two year period.
- System Testing and performance monitoring over the two year trial period.
- Technical Report detailing the results of the long term trial implementation and a conclusion as to whether wireless gas detection can be used in UK Gas Transmission compressor cabs.

Phase 4: Making long term trial solution permanent and certified

- Conversion of trial solution to permanent solution
- Capturing of all learning and development of necessary policies, methodologies and work procedures for Wireless as detection use in UK Gas Transmission compressor cabs

Scope

Fixed gas detection is required within compressor cabs to minimize the risk of an explosion. At the time of each compressor cab construction (from 1970 onwards), the number and location of installed detectors was dependant on the guidance and gas detector technology available at the time. New or additional gas detection is required in compressor cabs as a result of:

- New standards / guidance - BS ISO 21789 (2009) requires that at least one gas detector is located in the ventilation outlet (because a gas leak will always reach this location). This requires one or more gas detectors to be moved or added to the system.
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cable infrastructure. Wired gas detectors can also place constraints on where gas detectors can be located.

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Objective(s)

The aim of this innovation assessment project is to determine whether wireless gas detection can be used in Gas Transmission compressor cabs.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Identify and test the most suitable wireless gas detector currently on the market to determine the system business readiness for use in Gas Transmission compressor cabs.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

- Initially desktop research will be undertaken to review the wireless gas detection systems on the market. This will determine the best wireless gas detector commercially available at present that has potential to provide a solution to the problems identified.
- To gain knowledge and determine whether this wireless gas detector is business ready for use in Gas Transmission compressor cabs, the selected wireless gas detector system will then be procured for testing. Short term tests are initially required to assess the wireless signal strength for the range of compressor cab constructions, configurations and environments. This testing will also provide the opportunity to test any other items identified in the challenge and review workshop that can be resolved during short term testing.
- Provided the short term tests provide positive results, the wireless gas detector system will then be installed on one site for long term testing (up to 2 years) to assess the systems performance for all potential activities on site to confirm whether the system can operate securely and reliably. A long duration test is required to ensure the system is exposed to all potential issues that could affect the system performance and demonstrate the detector battery performance.
- The outcome of the testing and conclusion of the assessment will be applicable to all compressor sites across the NTS in the UK.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The initial research and challenge/review workshop will be undertaken at the DNV GL offices in Loughborough.

The wireless gas detector system testing (three short term (1 day) and one long term (up to 2 years) test will take place on three or four different UK Gas Transmission compressor sites on the NTS. The compressor sites selected for testing will be selected based on their site layout/configuration and the type of compressor cab construction. The sites will be selected in the first part of the assessment.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£272,740 (phases 1-4)

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

Total estimated savings of £815,000, over a 10 year period.

An estimated saving of ~£740,000 associated with replacing wired gas detector systems in 13 compressor cabs on five compressor sites with wireless gas detection systems over a 10 year period. This estimate is based on installing 7 new gas detectors in each compressor cab on three compressor sites with three compressor cabs and two compressor sites with two compressor cabs.

Additional estimated cost saving of ~£75,000 could also be realised when adding an additional gas detector to a wireless gas detection system rather than a wired gas detector system over a 10 year period. This estimate is based on one additional gas detector in five compressor cabs and assumes that new cable infrastructure would be required in three of the compressor cabs to add a new wired gas detector.

Please provide a calculation of the expected benefits the Solution

Base Cost: it is estimated that a gas detection system replacement on a site with three compressor cabs would cost £645,000; and costs associated with two compressor cabs would cost £430,000. This includes design, materials, installation, commissioning, drawings, optimizing gas detection locations following installation, maintenance and access provision.

Method Cost: Installation of a wireless gas detection system is estimated to cost £475,000 for a site with three compressor cabs; and £315,000 for a site with two compressor cabs. These costs reflect an anticipated approximate saving per compressor cab in design (£6,000), installation cost (£13,000), documentation (£5,000), maintenance (£5,000), optimizing gas detector locations (£8,000), project delivery (£10,000) and detector access provision (£10,000).

Additional savings:

Base Cost: Where an additional gas detector is required on an existing wired system, it is estimated adding a wired detector would cost between £10,000 (if existing cable infrastructure is available) and £30,000 (if new cable infrastructure is required).

Method Cost: If a wireless gas detection system is already installed, it is estimated that adding an additional gas detector would cost in the region of £7,000.

Safety improvements when using wireless gas detection are anticipated by:

- Enhancing the gas detection within a compressor cab by installing one or more detectors where it was not previously possible due to wiring constraints
- Enhancing gas detection by optimizing the gas detector locations after installation without cabling restrictions.
- Providing safer access to gas detectors

Please provide an estimate of how replicable the Method is across GB

The use of a wireless gas detection system is replicable across all compressor cabs on a Gas Transmission System.

Within the National Transmission System, compressor cabs are located on 24 Gas Transmission operational sites (1 Terminal and 23 Compressor Sites). The Method could also be applied to similar types of enclosures on the Network requiring gas detection.

Please provide an outline of the costs of rolling out the Method across GB.

Updating specifications is expected to cost £5,000. Site personnel would require training on maintaining and operating the wireless gas detection system. This is estimated to cost £1,000 per compressor site installation. The total training cost could therefore be £24,000 for all 24 Gas Transmission operational compressor sites.

No further costs are anticipated when rolling out the method.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

- The primary learning generated could be used by any licensees who operate compressor cabs to determine whether wireless gas detection can successfully be used to enhance gas detection or reduce the cost of any future gas detector system modifications or replacements in this application.
- The network licensees could also use the learning generated to assess whether wireless gas detection will work in other types of enclosures where gas detection is required on their installations.
- The project results will be disseminated through the National Grid website and ENA learning portal.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

This assessment project fits within optimizing asset management as part of the Reliability theme. It also fits within the Strategic and

Safety themes as part of National Grid's Innovation Strategy.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

This project has been approved by a senior member of staff

☑ Yes